भारतीय मानक

Indian Standard

IS 10872 : 2023

मेलाथियान — सुरक्षा संहिता

(पहला पुनरीक्षण)

Malathion — Code of Safety

(First Revision)

ICS 13.300; 71.060.50

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FOREWORD

This standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Chemical Hazards Sectional Committee had been approved by the Chemical Division Council.

Malathion is an organo-phosphorus insecticide-acaricide used extensively in India and all over the world for control of a wide spectrum of insects and mites in agriculture, horticulture, veterinary, public health and household complex.

Malathion insecticide-acaricide is itself a poor inhibitor of the enzyme cholinesterase. However, on conversion into its oxygen analog, malaoxon, for example, by liver enzymes, it in activates cholinesterase leading to accumulation of acetylcholine at synopses in the nervous system, skeletal and smooth muscles, and secretory glands. These are stimulated at low and depressed at high concentrations of malaoxon. However, due to rapid detoxification by aliesterases in the liver and other organs, malathion is of lower toxicity than most other pesticides and continues to be one of the safer pesticides known to man. The elimination of accidents is vital to public interest. Accidents produce social and economic loss, and impair individual or group productivity. Realization of this loss has led the authorities to devote a good deal of attention to safety education. Apart from general precautions, some typical precautions are required to be taken during manufacture, storage and handling of malathion. This code of safety lays special emphasis on these points.

The properties of malathion listed in **4** have been taken from literature and have been included for information only. Moreover, these properties pertain to pure malathion. BIS has published a separate standard IS 1832 : 1978 on the requirements and the methods of sampling and test for malathion intended for industrial purposes.

This standard was originally published in 1984. With a view to update the standard based on the experience of last two decades and on the currently available data, the Committee felt a need to revise the standard.

In this revision all the amendment issued, and general properties have been incorporated and modifications have been made to update safety measures for controlling hazards and essential information on symptoms of poisoning, first-aid, medical treatment, storage, handling, labelling and employee safety.

The various clauses of the standard have been aligned with the format being applied for all Indian Standards on code of safety of chemicals.

There is no ISO standard on the subject. In preparation of this standard considerable assistance has also been derived from the following publications:

a) The merck index-an encyclopedia of chemicals, drugs, and biologicals, Cambridge, UK Royal Society of Chemistry, 2013;
b) Sax's dangerous properties of industrial materials, volume three, 11th edition, Richard J. Lewis Sr., Wiley-interscience publication, 2004;
c) NIOSH, Pocket Guide to Chemical Hazards, U.S. Department of Health and Human Services Centres for Disease Control, 1990 (National Institute for Occupational Safety and Health); and
d) IPCS-International Program on Chemical Safety, 2004 edition.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

Indian Standard

MALATHION — CODE OF SAFETY

(First Revision)

1 SCOPE

1.1 This code describes properties of malathion, nature of hazards associated with it, medical information on symptoms and signs of poisoning; differential diagnosis; measures for first aid and medical treatment; good safety practices in storage, handling transport and use; decontamination and disposal of containers and spillage; and requirements for safety education.

1.2 This code does not deal with specifications for design of building; engineering and safety equipment; methods and ingredients used in manufacture; or with application dosages and directions for use as a pesticide.

2 REFERENCES

The standards given below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards:

IS No.	*Title*
IS 1260 (Part 1) : 1973	Pictorial markings for handling and labelling of goods: Part 1 Dangerous goods (*first revision*)
IS 3043 : 2018	Code of practice for earthing (*second revision*)
IS 4155 : 2023	Glossary of terms relating to chemical and radiation hazards and hazardous chemicals (*first revision*)
IS 8190 (Part 2) : 1988	Requirements for packing of pesticides: Part 2 Liquid pesticides (*second revision*)

3 TERMINOLOGY

For the purpose of this standard the definitions given in IS 4155 shall apply.

4 PROPERTIES

4.1 General Information

Malathion is an insecticide in the chemical family known as organophosphates.

4.1.1 *Chemical Name* — S-l, 2-di (ethoxycarbonyl) ethyl O-o dimethyl phosphorodithioate and dimethyl dithiophosphate of diethyl mercaptasuccinate

4.1.2 *Common Name and Synonyms* — malathion, maldison, mercaptothion, carbofos

4.1.3 *Uses*

A non-systemic insecticide and acaricide of low mammalian toxicity. Used to control coleoptera, diptera, hemiptera, hymenoptera and lepidoptera in wide range of crops, including cotton, pome, soft and stone fruit, potatoes, rice, vegetables. Used extensively to control major arthropod disease vectors (culicidae) in public health programmes, ectoparasites (diptera, acari, mallophaga) of cattle, poultry, dogs and cats, human head and body lice (anoplura) household insects (diptara, othoptera) and for the protection of stored grain.

4.2 Identification

4.2.1 *Formula* — $C_{10}H_{19}O_6PS_2$

4.2.2 *CAS Number* — 121-75-5

4.2.3 *UN Number* — UN3082

4.2.4 *UN Class* — Class 9

4.2.5 *Hazchem Code* — 2X

4.3 Physical Properties

4.3.1 *General*

Colourless, yellow, amber or brown clear liquid. Technical grade has mercaptan-like odour.

4.3.2 *Molecular Mass* — 330.36

4.3.3 *Physical State* — liquid

4.3.4 *Colour* — colourless, yellow, amber or brown clear liquid

4.3.5 *Odour* — mercaptan-like odour

4.3.6 *Boiling Point* — 2.85 °C

4.3.7 *Melting Point* — 156 °C to 157 °C at 9.3 kPa (with slight decomposition)

4.3.8 *Vapour Density* — not available

4.3.9 *Specific Gravity* — 1.23 minimum at 25 °C

4.3.10 *Viscosity at* 25 °C — 36.78 centipoise (0.368 dyne/s/cm^2), at 40 °C 17.57 centipoise (0.176 dyne/s/cm^2)

4.3.11 *Vapour Pressure at* 30 °C — 5.29 × 10^{-3} Pa at 30 °C

4.3.12 *Heat of Combustion* — not available

4.3.13 *Refractive Index at* 25 °C — 1.498 5

4.3.14 *Solubility in Water* — almost insoluble in water (0.000 3 g/100 g water at 20 °C)

4.3.15 *Solubility in Other Solvents* — about 145 ppm in water at 25 °C, completely miscible in most alcohols, esters, high aromatic solvents, ketones and vegetable oils; poorly miscible with aliphatic hydrocarbons

4.3.16 *Light Sensitivity* — no data available

4.4 Chemical Properties

4.4.1 *Reactivity*

Malathion is rapidly hydrolysed at *p*H above 7.0 or below 5.0, but it is stable in aqueous solutions buffered at *p*H 5.26. Malathion liquids may gel if stored in direct contact with iron or tin plate and therefore should be kept in container with internal protective coatings.

4.4.2 *Polymerisation* — will not occur

4.4.3 *Allotrope Formation* — unstable with rise of temperature above 160 °C

4.4.4 *Corrosion Properties* — in presence of moisture

4.5 Fire and Explosion Hazard Properties

4.5.1 *Ignition Temperature* — data not available

4.5.2 *Auto Ignition Temperature* — data not available

4.5.3 *Flash Point* — above 160 °C (320 °F)

4.5.4 *Upper Explosive Limit* — data not available

4.5.5 *Lower Explosive Limit* — data not available

5 HEALTH HAZARD AND TOXICITY INFORMATION

5.1 General Information

a) Malathion is not cumulative in body tissues;

b) Due to its effect on cholinesterase, continued exposure may ultimately reduce cholinesterase activity to hazardous levels; and

c) Evidence from long-term studies show that malathion is not carcinogenic, mutagenic, teratogenic and shows no delayed neurotoxicity in man and experimental animals.

5.2 Routes of entry

a) Respiratory — poorly absorbed by inhalation and through skin; and

b) Skin — not available.

5.3 Toxicity Information

5.3.1 *Acute Toxicity* — Moderate toxicity by ingestion, and low toxicity by dermal absorption or inhalation. Typical acute toxicity values for technical grade malathion are:

a) Oral Lethal Dose (LD_{50}) rat — 290 mg/kg;

b) Inhalation Lethal Concentration (LC_{50}) rat (1 h) — 84.6 mg/m^3; and

c) Immediately Dangerous to Life or Health (IDLH) — 250 mg/m^3.

5.3.2 *Inhalation No-Effect-Level* (*84 Exposures in 42 Consecutive Days*) *for Man* — 64.8 mg/m^3

5.4 Antidote

Atropine sulphate and pralidoxime chloride or obidoxime chloride.

5.5 Health Effects — Signs and Symptoms of Poisoning, Diagnosis and Medical Treatment Advice

5.5.1 Initial symptoms may include such non-specific features as malaise, anorexia (lack of appetite), frontal headache, anxiety, nausea and vomiting.

5.5.2 Progressive diagnostic symptoms, for example, from inhalation or eye, exposure to very high concentrations, include the following — hyper-salivation, sweating, rhinorrhea, tightness in chest, laryngeal spasm (wheezing), productive cough, and visual difficulties, that is, aching in and behind eyes, blurring of distant vision, lachrymation (tears). At this point, muscular fasciculations and tremors may occur.

5.5.3 In severe cases, for example, ingestion symptoms in **5.5.2** are accompanied by pinpoint and non-reactive pupils, abdominal cramps, diarrhoea, loss of reflexes and sphincter control, cyanosis, convulsions,

prostration, and pulmonary edema (up to 12 h after poisoning). Sudden unconsciousness or toxic psychosis resembling, acute alcoholism, extreme bradycardia (slow heart-beat), cardiac arrhythmias and heart block may be observed. Respiratory depression can be caused by toxicant and also by hydrocarbon solvent.

5.5.4 Continuing absorption at intermediate doses may cause an influenza-like illness characterised by weakness, anorexia and malaise.

5.5.5 Miosis is typical in moderate to severe poisoning while hyperglycemia and glycosuria without acetonuria may be noted in severe cases.

5.5.6 Onset of symptoms may be after 5 min in case of ingestion or aspiration of large quantities, but is usually within 12 h and always less than 24 h typically being one or more hours after direct skin or eye contamination. The delay of symptoms is due to malathion, itself a poor cholinesterase inhibitor.

5.5.7 *Differential Diagnosis*

5.5.7.1 Diagnosis is based primarily on a history of exposure to malathion and on clinical evidence of diffuse parasympathetic stimulation. Distinguish from cerebral haemorrhage, heat exhaustion, hypoglycaemic episode, and lung and alimentary diseases, for example, pneumonitis, gastro-enteristis.

5.5.7.2 Laboratory evidence of depression of plasma and/or RBC (red blood cell) cholinesterase to levels much below pre-exposure levels (at least 50 percent and usually much lower) is confirmation of organophosphorus poisoning, although on occasions this may be less pronounced than might be expected from the state of the patient. (Some individuals may have normally low plasma cholinesterase activity due to genetic reasons, that is, generation of typical enzyme from liver). If organophosphate poisoning is likely, do not delay treatment pending confirmation of diagnosis by blood analysis. Careful observation of effects of atropine and prelidoxime or obidoxime (toxogenin) may help diagnosis that is failure of parenterally administer 1 mg to 2 mg atropine to produce signs of atropinization (flushing, mydriasis, tachycardia, dryness of mouth) indicates organophosphorus poisoning. Injection of pralidoxime (1 g intravenous) or obidoxime (250 mg intramuscular) generally causes some recovery from signs and symptoms of poisoning.

5.5.8 *Emergency Aid Measures*

When symptoms of poisoning appear, decontaminate victim at once as follows:

a) *If skin and body parts contaminated*

Remove contaminated clothing and wash skin thoroughly with generous amounts of soap or detergent and water for at least 10 min, preferably under a shower or by submersion in a pond or other body or water if the exposure has occurred in the field. Careful attention must be paid to cleansing of skin and hair;

b) *If inhaled in large amounts*

Remove to open fresh air and if needed, give artificial respiration;

c) *If eyes are contaminated*

Irrigate conjunctiva with clean water for 10 min, keeping eyelids open; and

d) *If swallowed*

Avoid mouth-to-mouth respiration. Give activated charcoal up to 50 g (5 to 10 tablespoon heapful) in 0.5 to 1.0 litre warm water (for children 1 to 2 tablespoon heapful in 1 to 2 cups of water). Inducing vomiting with common salt (2 to 4 tablespoon) in a glass of warm water can help to evacuate stomach quickly but should not be tried if victim is unconscious or if malathion emulsifiable concentrate (containing petroleum distillates) has been ingested, so as to avoid any chance aspiration into lungs. Vomiting should be induced only when conscious victim is lying on his side with the head dependent. After vomiting, have the victim drink a suspension of 30 g activated charcoal in about 100 ml water to limit absorption of remaining toxicant in gut. Take victim to hospital at once in all cases of ingestion.

5.5.9 *Medical Treatment of Acute Poisoning*

5.5.9.1 Treatment in general ranges from simple removal from exposure in mild cases to the rapid and simultaneous application of antidotal and supportive measures in severe cases. Delay in treatment can be life-threatening.

If symptoms of poisoning appear; at once give atropine sulphate and pralidoxime chloride or obidoxime chloride as follows, whenever possible with supportive measures (*see* **5.5.12**) being performed concurrently.

5.5.9.2 *Atropine sulphate therapy*

5.5.9.2.1 *Mild to moderate poisoning*

a) *Dosage for adults and children above* 12 *years* — 0.4 mg to 2.0 mg (1.0 ml to 5.0 ml of usual 0.4 mg/ml solution) by slow intravenous injection (I.V.) or intramuscularly if I.V. injection is not possible. This dose (2 mg) of atropine is about ten times the dose for other conditions in which atropine is considered therapeutic. The dose (2 mg) may be repeated, with or without oxime, at 5 min to 10 min intervals, depending upon response to first dose, until signs of atropinization appear; dry flushed skin, tachycardia (rapid pulse) as high as 140 beats/min, drying of secretions, that is, fall in salivation or dryness of mouth. Maintain a mild degree of atropinization for about 12 h to 24 h, or even up to 48 h in severe cases, to avoid relapse.

b) *Dose for children under* 12 *years* — 0.05 mg/kg body weight, that is 0.125 ml/kg body weight of usual 0.4 mg/ml solution, repeat every 15 min to 30 min until atropinization is achieved. Maintain atropinization further with repeated doses of 0.02 mg/kg to 0.05 mg/kg body weight. Atropine protects the end-organs from high concentrations of acetylcholine. It does not reactivate cholinesterase, hence patient should be watched closely for the effects of unmetabolized toxicant may reappear as atropinization wears off. Less atropine may be needed after administration of oxime, for example, pralidoxime or obidoxime.

5.5.9.2.2 *In severe cases*

Persons with respiratory difficulties, convulsions and unconsciousness should be given 4 to 6 mg (proportionally lower for children) atropine sulphate I. V. initially, followed by repeated doses of 2 mg or as much as is needed to maintain full atropinization for at least 2 to 3 days. This should be done, whenever possible, concurrent with supportive measures for ensuring open airway and continued respiration (*see* **5.5.12.2**). Atropine may cause ventricular fibrillations in cyanotic patients, and should be given only after satisfactory oxygenation/respiration is achieved. Patient's condition, including respiration, convulsions, blood pressure, pulse frequency and salivation should be carefully observed as a guide to further administration of atropine. Initially atropine may have to be given at intervals of 5 min to 10 min. Every 2 mg dose should give a short-lasting improvement of respiration and reduction in cyanosis and convulsions. There may also be a short lasting decrease of miosis. Tachycardia may occur and a careful watch must be kept on salivary secretion to prevent over-atropinization (signs for which are muscle twitching, fever, delirium). Usually, it may not be necessary to exceed 50 mg atropine per day.

5.5.9.3 *Oxime therapy*

Oximes are specific reactivators of inhibited cholinesterase and these should be used in cases of severe poisoning by organophosphate pesticides in which muscle weakness and twitching persist despite atropine therapy.

5.5.9.3.1 Following atropinization slowly inject 1 g pralidoxime as a 5 percent solution (1 g in 20 ml sterile water) at no more than 0.5 g/min, preferably over 5 min. Repeat dose hourly, if muscle weakness is not relieved. In very severe cases, this dose may he doubled. Slow administration may be achieved by giving pralidoxime in 250 ml normal saline by continuous intravenous drip over a 30 min to 60 min interval, for example, at the rate of 0.5 g/h for adults and proportionally lower for children taking care not to overload patient with fluid. If intravenous injection is possible, pralidoxime may be given by deep intramuscular injection. For pharmaceutical reasons, combination of atropine and pralidoxime is impracticable, hence the latter must be given at once after the former. After injecting pralidoxime, the effects of atropine may become more evident and a reduction in dosage schedule of the latter may be needed. Pralidoxime treatment is most effective within 24 h of poisoning.

5.5.9.3.2 Obidoxime chloride (toxogonin) may be used instead of pralidoxime. Dosage – 250 mg slow I.V. or better intramuscular injection for adults and proportionally lower for children. Obidoxime has the advantage that it can be injected along with atropine intramuscularly especially in severe cases where patient needs treatment before full medical attention is available.

5.5.10 DO NOT GIVE MORPHINE, AMINOPHYLLINE, PHENGTHIAZINE, TRANQUILIZERS OR RESERPSNE. Give adrenergic amines only if there is a specific indication.

5.5.11 If intractable convulsions (unresponsive to antidotes) occur in cases of severe poisoning, causes unrelated to organo-

phosphate action may be responsible, such as head trauma, cerebral anoxia, and mixed poisoning.

Although not thoroughly tested in these circumstances, diazepam (valium, calmpose) (5 mg to10 mg for adults, 0.1 mg/kg to 0.2 mg/kg for children under 6 years or 23 kg body weight) is probably the safest and most reliable anticonvulsant.

CAUTION — Be prepared to assist pulmonary ventilation mechanically, if respiration is depressed, and to counteract phypotensive reactions.

5.5.12 *Supportive Measures*

5.5.12.1 Whenever possible, following measures should be performed concurrently with atropine and oxime therapy, especially in severe cases.

5.5.12.2 It is essential to ensure that patient maintains a clear open airway and continued respiration as follows:

a) If patient is cyanotic, put him in a prone position with head down and to the left, mandible extended and tongue pulled forward. Clear mouth and pharynx of secretions with a cloth and by aspiration;

b) If airway obstruction persists, use an oropharyngeal or nasopharyngeal airway or endotracheal tube, with aspiration at secretions; and

b) If needed, maintain respiration with oxygen and mechanical means, for example, intermittent positive-pressure breathing apparatus.

5.5.12.3 If ingested in quantity sufficient to cause poisoning promptly evacuate stomach as follows:

a) If patient is conscious and alert, and respiration is not depressed, induce vomiting by tickling throat with a blunt spoon or finger or by giving 2 to 4 tablespoon heapful common salt in a glass of water;

b) If petroleum solvent has been ingested, there is risk of aspiration into lungs during vomiting, which could lead to chemical paeumonitis, hence vomiting in such cases should be induced only when the conscious patient is lying on his side with head dependent;

c) In hospital, evacuation of stomach can be done by incubation aspiration and lavage followed by catharsis as follows:

1) If patient is unconscious, respiration is depressed, and cough and gag reflexes are poor, insert a cuffed endotracheal tube prior to gastric intubation, to protect the lungs and maintain patent airway;

2) Keep patient's head below level of stomach during intubation and lavage (that is, in Trendelenburg position or left lateral decubitus with head of table dipped downward);

3) In conscious patients and even unconscious patients with intact cough and gag reflexes, a large bore stomach tube (16 mm outside diameter) may be passed into the esophagus to a distance of 50 cm in adults;

4) Promptly aspirate pharynx as regularly as possible to remove contents if gagging or vomiting occurs during intubation;

5) When gastric tube is in place, aspirate thoroughly before lavaging stomach with 300 ml (or less) isotonic saline or 5 percent sodium bicarbonate warmed to body temperature. Repeat till returning fluid clear. Before removing gastric tube, instil a slurry of 30 g activated charcoal in 100 ml of water to limit absorption of any remaining toxicant;and

6) If bowel movement has not occurred within four hours of ingestion, give sodium sulphate in water by ingestion (if patient conscious) and by gastric tube (if patient unconscious) to speed elimination of toxicant.

Dosage –

i) Adults (12 years and older) — 15 g in about 200 ml of water; and

ii) Children under 12 years — 0.2 g/kg body weight in 50 ml to 100 ml of water.

d) Isotonic salt or balanced electrolyte solution may be given intravenously very cautiously to correct dehydration and electrolyte imbalance. In any case, avoid large amounts of intravenous fluids;

e) Continuous and intensive observation of serious patients for at least 24 h after initial improvement is essential since serious and sometimes fatal relapses (sometimes pulmonary edema) may occur due to continuing absorption of the toxin or dissipation of the effects of the antidotes. It is essential to decontaminate patient thoroughly before or during antidota1 measures (*see* emergency aid measures **5.5.8**);

f) In severe cases, it may be necessary to treat for respiratory acidosis, pulmonary infections or pulmonary edema; and

g) Taking blood samples for plasma and red cell cholinesterase determinations before and during treatment, can help to monitor recovery of patient.

6 PERSONAL PROTECTIVE EQUIPMENT

6.1 Fresh air supply masks should be provided inside the manufacturing plant wherever raw materials feeding systems are there.

6.2 The following non-respiratory, protective devices are recommended for use:

a) Chemical safety goggles, cup-type rubber framed or plastic goggles with impact resistant glass;

b) Plastic face shields of full length with forehead protection;

c) Safety shoes, hat, gloves made of rubber may be used to guard against liquid leaks or splashes; and

d) Full body overalls may also be worn and all contaminated clothing should be removed promptly and laundered and thoroughly dried before use.

7 STORAGE, HANDLING, LABELLING AND TRANSPORT

7.1 Storage

7.1.1 Always store malathion in closed and clearly labelled lacquered metal drums or other suitable vessels, away from moisture and heat.

7.1.2 The rooms or premises meant for storing malathion should be well-built, dry, well-lit and ventilated and of sufficient dimension.

7.1.3 Flooring should be acid proof such that any leaks or spills do not damage flooring.

7.1.4 It is desirable to have fire-proof electric fittings in the storage areas.

7.1.5 Fire protection measures should be taken in storage area.

7.2 Handling

7.2.1 Usual method or procedure for handling and transport of chemical from storage/containers:

a) When opening containers, transferring material, or while mixing, avoid contact with mouth, skin and eyes. If necessary, especially when handling dusts, a facial visor and gloves should be worn;

b) Mixing, if not mechanical, should always be carried out with a paddle of suitable length. Splashes should be washed at once from the skin or eyes with large quantities of water;

c) All operators should be provided with soap and washing facilities to ensure strict personal hygiene at the end of each working day. If contaminated, clothing should be washed at the end of the working day. Before eating, drinking or smoking, hands and other exposed skin should be washed with soap or detergent and water; and

d) Mixers and baggers should wear rubber boots, gloves, aprons and masks. Spraymen should be provided with canvas shoes or boots, overalls, and caps with downturned brims.

7.2.2 *Decontamination and Disposal of Containers and Spillage*

a) *Containers*

Residual malathion preparations in containers should be emptied in a diluted form into a deep pit taking care to avoid ground waters. The empty container may be decontaminated by rinsing two or three times with water and scrubbing the sides. An additional rinse should be carried out with 5 percent sodium hydroxide solution which should remain in the container overnight. Impermeable gauntlets (elbow-length gloves) should be worn during this work and a soakage pit

should be provided for the storing. Decontaminated containers should not be used for storing food and drink;

b) *Spillage*

Malathion should be removed by washing with 5 percent sodium hydroxide solution and then rinsing with large quantities of water; and

c) *Incineration*

Decontamination of containers and residual malathion may be achieved by incineration above 700 °C followed by absorption of resulting gases in aqueous or alkaline scrubbers or washing towers.

7.3 Transport

7.3.1 For in plant, mechanized loading and unloading of containers helps to minimize chance exposure of operators to malathion.

7.3.2 Always store malathion in dry, leadproof containers as laid down in IS 8190 (Part 2).

7.3.3 Each container (including tankers) should carry an identifying label or stencil as depicted in IS 1260 (Part 1). The storage containers shall be labelled or marked to identify as follows:

a) Contents of the container;

b) Name and address of the manufacturer or importer of the hazardous chemical; and

c) Physical, chemical and toxicological data as per the criteria given in the relevant schedule of the *Manufacture, Storage and Import of Hazardous Chemicals Rules*, 1989 and *Insecticides Rules*, 1971.

While referring to the statutes, the stipulations given in the subsequent amendments of those statutes shall be taken into account. Manufacturers name with label warnings required by regulations or ordinances form part of the label or placard.

NOTE — If transport of the hazardous chemical is involved it shall be carried out in accordance with the *Central Motor Vehicles Rules*, 1989 and chapter VII of *Insecticides Rules*, 1971. While referring to the statutes, the stipulations given in the subsequent amendments of those statutes shall be taken into account.

8 SPILLAGE, LEAKAGE AND WASTE DISPOSAL

8.1 In case of leaks or spills, fire or explosion danger are not there but on exposure, danger of toxic vapour is there.

8.2 Spraying of soda ash and flushing with water should be done for decontamination.

8.3 Ventilation, quick washing and drainage are advisable.

8.4 Persons engaged in above should avoid direct contact.

8.5 Waste Disposal

8.5.1 The waste materials obtained and the corresponding instructions for disposal are summarized below:

Sl No. (1)	*Waste Material* (2)	*Disposal Instructions* (3)
i)	No solid waste obtained	—
ii)	Washings of intermediates of malathion are alkaline in nature and are the only liquid waste	Washings should be neutralized
iii)	Hydrogen sulphide (H_2S) is produced as gaseous waste	Hydrogen sulphide should not be absorbed in caustic lye

9 FIRE PREVENTION

9.1 Provision of flame proof electrical equipment may be made.

9.2 Open flames should be strictly prohibited inside the plant. Other ignition sources should be controlled to the maximum extent possible.

9.3 Earthing of individual equipment may be done in accordance with IS 3043.

10 TRAINING

10.1 Employees handling malathion shall be provided with information on the properties of malathion before they handle, through well planned training programme.

10.2 Preplacement training in emergency procedures shall include fire fighting, how to deal with spills, disposal procedures and first aid.

10.3 Periodical refresher training shall be imparted to the staff members who handle malathion on the various aspects.

11 HEALTH MANAGEMENT, FIRST-AID AND MEDICAL TREATMENT

11.1 Health Monitoring

11.1.1 Diagnostic studies of persons for pre-employment should include electrocardiogram, sputum gram, stain and culture, differential white blood cell count, and arterial blood gas analysis.

11.1.2 The medical examination should take place every year.

11.1.3 Proper records should be kept of medical examinations.

11.2 FIRST AID

11.2.1 *Action in Emergency*

11.2.1.1 *Poisioning*

a) Loosen tight clothing and remove obstructions, if any;

b) Take off the contaminated clothing immediately;

c) Apply artifical respiration immediately if breathing is stopped or irregular; and

d) If swallowed, do not induce vomiting when patient is unconscious or is in convulsions. If the patient can swallow, give milk, water of milk of magnesia.

11.2.1.2 *Inhalation*

a) Move the patient to fresh air immediately; and

b) Carry out steps in **11.2.1.1** (a) to (d).

11.3 *Splash on Face or Eyes*

a) Holding eye lids open immediately wash the eyes and face thoroughly in the eye fountains or in a stream of running water;

b) Arrange for the immediate medical attention; and

c) Never use eye drops or other chemicals, as they may increase the extent of injury.

11.4 Information to be Provided to Physician Rendering Medical Aid

11.4.1 Send the patient with case history or full details of accident including the name of the chemical which caused the injury or sickness.

11.4.2 Include the suggested treatment if proper antidote, etc, could be specified confidently. Otherwise leave it to the physician.

12 ADDITIONAL INFORMATION

Incompatible with alkaline material, this product should be stored, handled and used in accordance with good industrial practices and in conformity with legal regulation. This information is based on our present knowledge for your guidance on safety requirements. It is not intended as a specification.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Chemical Hazards Sectional Committee, CHD 07

Organization(s)	*Representative(s)*
In Personal Capacity (*1204, Bhumika Residency, Sector 20 Block No 21 Roadpali Klambolinode, Navi Mumbai, 410218*)	SHRI K. S. RAMPRASAD **(*Chairperson*)**
Alkali Manufacturers Association of India, Mumbai	SHRI K. SRINIVASAN SHRI H. S. DAS (*Alternate*)
Bhabha Atomic Research Centre, Mumbai	MS GARIMA SINGH SHRI NISHITH GOSH (*Alternate*)
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Central Food Technological Research Institute, Mysuru	DR DANDAMUDI USHARANI DR PRASANNA VASU (*Alternate*)
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